

WHAT IS CLAIMED IS

1. A gas turbine plant comprising:
 - an air compressor;
 - a gas turbine;
 - a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;
 - a gas turbine combustor arranged between the air compressor and the gas turbine;
 - a fuel system for supplying a fuel to the gas turbine combustor; and
 - a heat exchange section for heating the fuel from said fuel system by means of a high pressure air as a heating source from the air compressor.
2. A gas turbine plant according to claim 1, wherein said heat exchange section is housed in the air compressor.
3. A gas turbine plant according to claim 1, wherein said heat exchange section is mounted to a casing of the air compressor.
4. A gas turbine plant according to claim 3, wherein said heat exchange section mounted to the casing of the air compressor has a structure that a fuel passage is formed by an outer cover covering an outer periphery of the casing, one side of the fuel passage being provided with a fuel inlet and a fuel outlet and another side of the fuel passage is provided with a connecting pipe.
5. A gas turbine plant comprising:
 - an air compressor;
 - a gas turbine;
 - a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;
 - a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;
an extraction closed circuit system provided for said air compressor; and
a heat exchange section provided for said extraction closed circuit system for heating the fuel supplied to the gas turbine combustor from the fuel system.

6. A gas turbine plant comprising:

an air compressor;
a gas turbine including an exhaust gas system;
a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;
a fuel system for supplying a fuel to the gas turbine combustor; and
a heat exchange section provided for said exhaust gas system of the gas turbine for heating the fuel supplied to the gas turbine combustor from the fuel system.

7. A gas turbine plant comprising:

an air compressor;
a gas turbine including a high temperature section;
a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;
a fuel system for supplying a fuel to the gas turbine combustor;
a high pressure air supply system operatively connected to the high temperature section of the gas turbine for supplying a high pressure air from the air compressor thereto;
a heat exchange section provided for the high pressure air supply system for heating the fuel supplied to the gas turbine combustor from the fuel system, the high pressure air after

the heating being supplied to the high temperature section of the gas turbine as a cooling medium; and

a high pressure air recovery system for recovering the an overall quantity or part of the high pressure air to the air compressor after cooling the high temperature section of the gas turbine.

8. A gas turbine plant according to claim 7, wherein the high pressure air supply system is divided into a plurality of high pressure air supply sections in accordance with a magnitude of pressure loss of the high pressure air passing through the high temperature section of the gas turbine, said plurality of high pressure air supply sections each being provided with a flow distributing device.

9. A gas turbine plant according to claim 8, wherein said flow distributing device is either one of a flow control valve and an orifice.

10. A gas turbine plant according to claim 8, wherein said high pressure air recovery system is divided into a plurality of high pressure air recovery sections so as to correspond to the divided plurality of high pressure air supply sections.

11. A gas turbine plant comprising:

an air compressor;

a gas turbine including a high temperature section;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;

a high pressure air supply system operatively connected to the high temperature section of the gas turbine for supplying a high pressure air from the air compressor thereto;
and

a heat exchange section provided for the high pressure air supply system for heating the fuel supplied to the gas turbine combustor from the fuel system, the high pressure air after the heating being supplied to the high temperature section of the gas turbine as a cooling medium and the high pressure air after cooling the high temperature section being joined with a gas turbine driving gas.

12. A gas turbine plant according to claim 11, wherein the high pressure air supply system is divided into a plurality of high pressure air supply sections in accordance with a magnitude of pressure loss of the high pressure air passing through the high temperature section of the gas turbine, said plurality of high pressure air supply sections each being provided with a flow distributing device.

13. A gas turbine plant according to claim 12, wherein said flow distributing device is either one of a flow control valve and an orifice.

14. A gas turbine plant comprising:
an air compressor; a gas turbine including at least one high temperature section;
a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine; a fuel system for supplying a fuel to the gas turbine combustor;

a high pressure air supply system operatively connected to the high temperature section of the gas turbine for supplying a high pressure air from the air compressor thereto;

a heat exchange section provided for the high pressure air supply system for heating the fuel supplied to the gas turbine combustor from the fuel system;

a first pressure rising compressor for rising a pressure of the high pressure air after heating the fuel and for supplying the high pressure air to at least one of the high temperature sections of the gas turbine as a cooling medium;

a second pressure rising compressor which is bypassed from an outlet side of the first pressure rising compressor and rising a pressure of the high pressure air after heating the fuel and for supplying the high pressure air to at least one of other high temperature sections of the gas turbine as a cooling medium; and

a high pressure air recovery system for recovering an overall quantity or part of the high pressure air after cooling the high temperature sections of the gas turbine to the air compressor.

15. A gas turbine plant comprising:

an air compressor;

a gas turbine including a plurality of high temperature sections;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;

a high pressure air supply system operatively connected to the high temperature sections of the gas turbine for supplying a high pressure air from the air compressor thereto;

a heat exchange section provided for the high pressure air supply system for heating the fuel supplied to the gas turbine combustor from the fuel system;

a plurality of pressure rising compressors for rising a pressure of the high pressure air after heating the fuel and for supplying the high pressure air to the high temperature sections, respectively, as a cooling medium; and

a high pressure air recovery system for recovering an overall quantity or part of the high pressure air after cooling the high temperature sections of the gas turbine to the air compressor.

16. A gas turbine plant comprising:

an air compressor;

a gas turbine including a plurality of high temperature sections;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;

a high pressure air supply system operatively connected to the high temperature sections of the gas turbine for supplying a high pressure air from the air compressor thereto;

a heat exchange section provided for the high pressure air supply system for heating the fuel supplied to the gas turbine combustor from the fuel system;

a pressure rising compressor for rising a pressure of the high pressure air after heating the fuel and for supplying the high pressure air to the at least one high temperature section as a cooling medium, said high pressure air supply system being directly connected to at least one of other high temperature sections so as to supply the high pressure air after heating the fuel as a cooling medium; and

a plurality of high pressure air recovery systems for recovering an overall quantity or part of the high pressure air after cooling the high temperature sections of the gas turbine to the air compressor in accordance with the plurality of high temperature sections, respectively.

17. A gas turbine plant comprising:

an air compressor;

a gas turbine including a plurality of high temperature sections;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;

a high pressure air supply system operatively connected to the high temperature sections of the gas turbine for supplying a high pressure air from the air compressor thereto;

a heat exchange section provided for the high pressure air supply system for heating the fuel supplied to the gas turbine combustor from the fuel system;

a pressure rising compressor for rising a pressure of the high pressure air after heating the fuel and for supplying the high pressure air to the high temperature sections of the gas turbine as a cooling medium;

a high pressure air recovery system for recovering an overall quantity or part of the high pressure air after cooling at least one of said high temperature sections of the gas turbine to the air compressor; and

a cooling recovery system for recovering the overall quantity or part of the high pressure air after cooling at least one of other high temperature sections of the gas turbine to an inlet side of the heat exchange section.

18. A gas turbine plant comprising:

an air compressor;

a gas turbine including a high temperature section; a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor; and

an air extraction closed circuit system provided for said air compressor, said air extraction closed circuit system being provided with a heat exchange section for heating the fuel from said fuel system and another heat exchange section for heating a heat utilizing device for heating a medium to be heated of the heat utilizing device.

19. A gas turbine plant comprising:

an air compressor;

a gas turbine including an exhaust gas system and being combined with a steam turbine;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;

a heat exchange section provided for the exhaust gas system of the gas turbine for heating a fuel supplied from the fuel system to the gas turbine combustor; and

a plurality of exhaust heat recovery heat exchange section provided for the exhaust gas system of the gas turbine for heating a feed water of the steam turbine plant so as to generate a steam.

20. A gas turbine plant comprising:

an air compressor;

a gas turbine including a high temperature section;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor; and

an air extraction closed circuit system provided for said air compressor, said air extraction closed circuit system being provided with a heat exchange section for heating the fuel from said fuel system to the gas turbine combustor, a valve opening control means for detecting a fuel leak into the high pressure air by a fuel leak detector, provided for the heat exchange section and for closing a fuel valve of the fuel system when a detection signal exceeds a predetermined value, and an alarm device for giving an alarm when the detection signal exceeds the predetermined value.

21. A gas turbine plant comprising:

- an air compressor;
- a gas turbine;
- a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;
- a gas turbine combustor arranged between the air compressor and the gas turbine;
- a fuel system for supplying a fuel to the gas turbine combustor; and
- a heat exchange section for heating the fuel from said fuel system by means of a high pressure air as a heating source from the air compressor, said heat exchange section being divided into a first heat exchange unit for heating an intermediate heating medium by a high temperature heating medium and a second heat exchange unit for heating the fuel by the thus heated intermediate heating medium.

22. A gas turbine plant comprising:

- an air compressor; a gas turbine;
- a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;
- a gas turbine combustor arranged between the air compressor and the gas turbine;
- a fuel system for supplying a fuel to the gas turbine combustor; and
- a heat exchange section for heating the fuel from said fuel system by means of a high pressure air as a heating source from the air compressor, said heat exchange section being divided into a high temperature chamber and a low temperature chamber and being provided with a heating pipe crossing the high temperature chamber and the low temperature chamber so that the heating pipe is heated by a high temperature heating medium in the high temperature chamber and the fuel is heated in the low temperature chamber.

23. A gas turbine plant comprising:

an air compressor including an air discharging means;

a gas turbine;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;

a discharge air recovery system provided so as to bypass the air discharging system of the air compressor, said air discharging means being provided with an air discharge valve to which is disposed a valve opening control means which opens and closes the air discharge valve in response to at least one signal of a rotational speed signal of a gas turbine shaft and a power signal of the driven equipment; and

a heat exchange section provided for the discharge air recovery system for heating the fuel supplied from the fuel system to the gas turbine combustor.

24. A gas turbine plant comprising:

an air compressor;

a gas turbine including at least one high temperature section;

a driven equipment, said air compressor, said gas turbine and said driven equipment being operatively connected in series;

a gas turbine combustor arranged between the air compressor and the gas turbine;

a fuel system for supplying a fuel to the gas turbine combustor;

a high pressure air supply system operatively connected to the high temperature section of the gas turbine for supplying a high pressure air from the air compressor thereto;

a heat exchange section provided for the high pressure air supply system for heating the fuel supplied to the gas turbine combustor from the fuel system;

a pressure rising compressor for rising a pressure of the high pressure air after heating the fuel and for supplying the high pressure air to at least one of the high temperature sections of the gas turbine as a cooling medium, said pressure rising compressor being connected to a gas turbine shaft; and

at least one high pressure air recovery system for recovering an overall quantity or part of the high pressure air after cooling the at least one of the high temperature sections of the gas turbine to the air compressor.

25. A gas turbine plant according to claim 24, wherein said pressure rising compressor is directly connected to the gas turbine shaft.

26. A gas turbine plant according to claim 24, wherein said pressure rising compressor is connected to the gas turbine shaft through a power transmission mechanism.

27. A gas turbine plant according to claim 26, wherein said power transmission mechanism section is composed of either one of a gear mechanism and a torque converter mechanism.